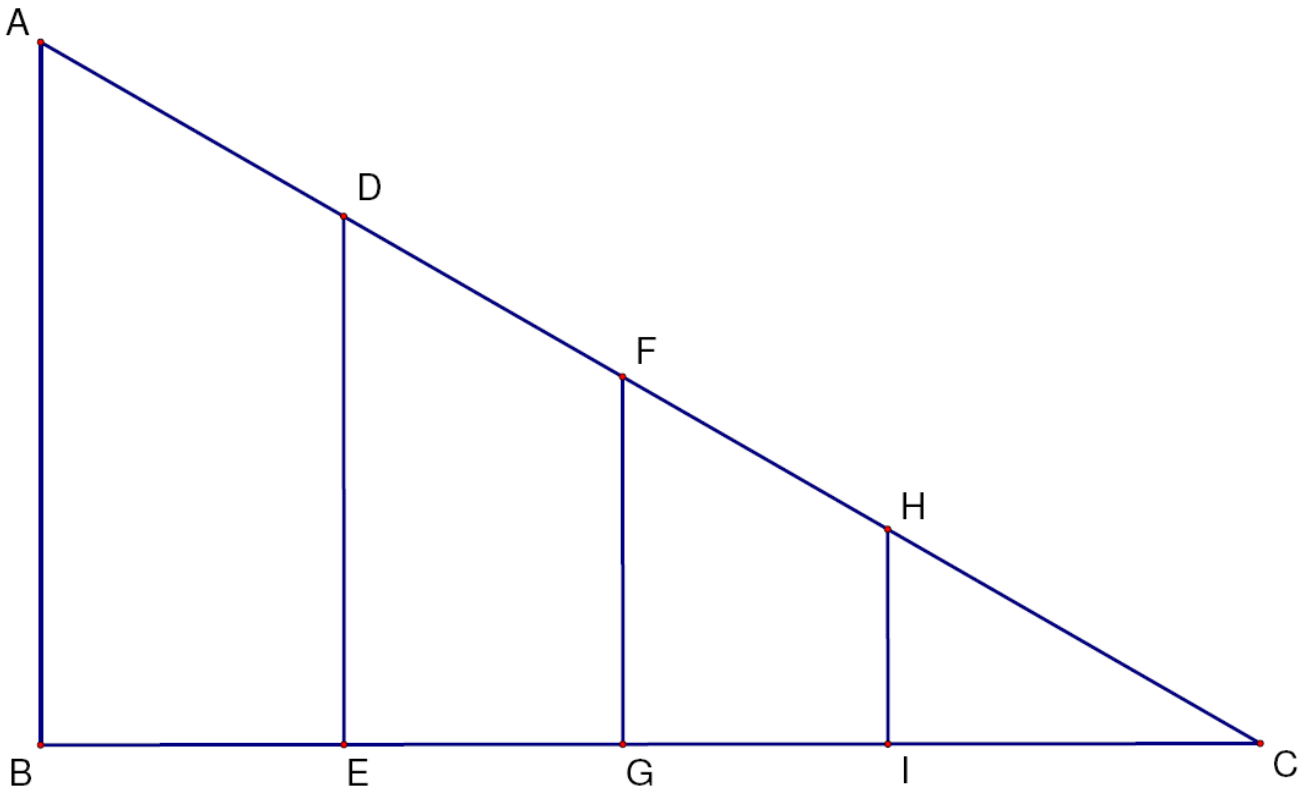
2.1.2: What's My Ratio?

Fill in this chart with measurements from the triangles on the NEXT page. You will need a ruler and a protractor.

Δ (state letter)	Angle	Length of hypotenuse	Length opposite side	Length of adjacent side	Determine the ratio to two decimal places		
					$\frac{opposite}{hypotenuse}$	$\frac{adjacent}{hypotenuse}$	$\frac{opposite}{adjacent}$
___	∠ ___°						
	∠ ___°						
___	∠ ___°						
	∠ ___°						
___	∠ ___°						
	∠ ___°						
___	∠ ___°						
	∠ ___°						

2.1.2a What's My Ratio?

1. In the diagram below, is ΔABC similar to ΔFGC? Justify your answer.



2. a) Using a protractor, measure each of the angles in the triangles below. Record your measurements in the chart on the previous page.

   b) Measure the length of the **hypotenuse** of each triangle (e.g. AC, DC, FC, HC). Record your measurements in the chart on the previous page.

   c) Measure the length of the side **opposite** to angle C in each triangle (e.g. AB, DE, FG, HI). Record your measurements in the chart on the previous page.

   d) Measure the length of the side **adjacent** to angle C in each triangle (e.g. BC, EC, GC, IC). Record your measurements in the chart on the previous page.

3. Complete the remaining three columns in the chart on the previous page.

2.1.3: What's My Ratio?

1. If you have a fifth triangle that is similar to your four triangles, what would your hypothesis be about the following ratios? Explain.

$\frac{\textbf{opposite}}{\textbf{hypotenuse}} =$	$\frac{\textbf{adjacent}}{\textbf{hypotenuse}} =$	$\frac{\textbf{opposite}}{\textbf{adjacent}} =$
Explanation:	Explanation:	Explanation:

2. Identify a relationship between the ratios in the chart for:

   $\frac{opposite}{hypotenuse}$ and $\frac{adjacent}{hypotenuse}$

3. Identify a relationship if you divide the ratio for $\frac{opposite}{hypotenuse}$ by $\frac{adjacent}{hypotenuse}$ for one of the angles.

2.2a: Using My Calculator

Make sure your calculator is in degrees!!

1. Evaluate each of the following to three decimal places:

   a) sin35° = _____ b) cos15° = _____

   a) tan50° = _____ b) sin52° = _____

   a) cos37° = _____ b) tan26° = _____

2. Determine each angle to the nearest degree:

   a) sin$A$ = 0.65 b) cos$B$ = 0.75

   A = _____ B = _____

   c) tan$C$ = 1.23 d) sin$D$ = 0.23

   C = _____ D = _____

   e) cos$E$ = 0.50 f) tan$F$ = 1

   E = _____ F = _____

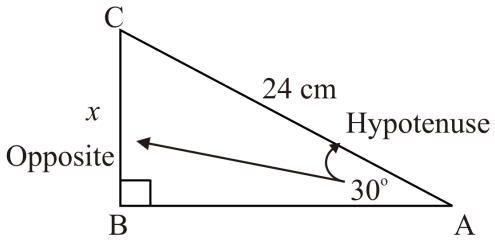
3. When do you need to use the "2nd" button on your calculator to solve a trigonometric equation?

4. Explain how you would solve the following two equations using your calculator:

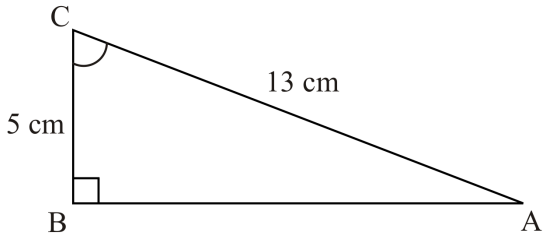
   a = sin30° and sinA = 0.5

2.4.1: What's My Triangle?

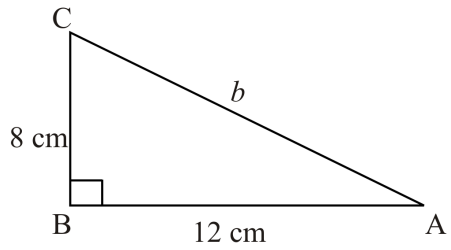
1. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x.* Solve for *x.*



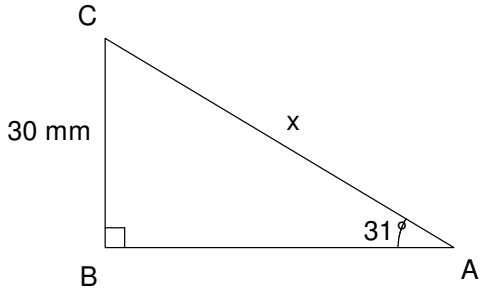
2. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find $\angle C$. Solve for $\angle C$.



3. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *b*. Solve for *b.*

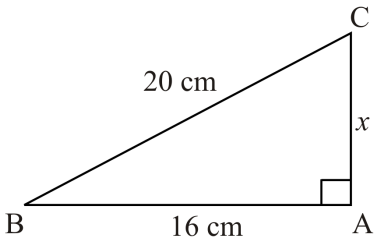


4. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x*. Solve for *x.*

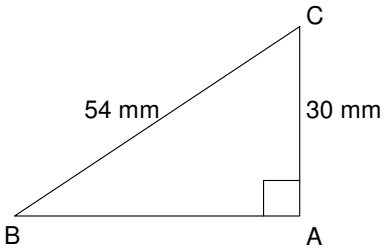


2.4.1: What's My Triangle? (Continued)

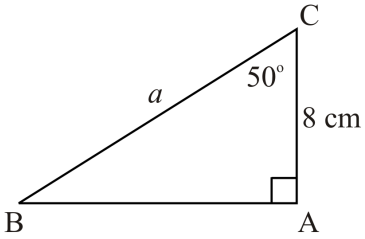
5. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x*. Solve for *x*.



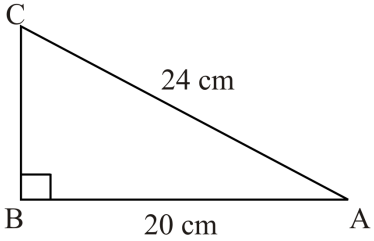
6. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find $\angle B$. Solve for $\angle B$.



7. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *a*. Solve for *a*.



8. Decide whether to use sine, cosine, tangent, or Pythagorean relationship to find $\angle C$. Solve for $\angle C$.

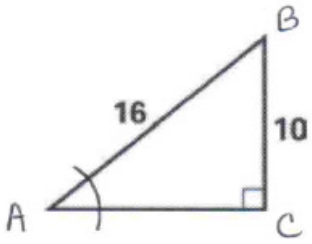


2.4.1a: Additional Practice

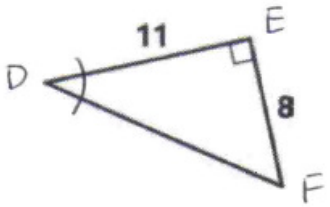
diagrams from http://www.mathweb.net/trig/pdfs/worksheets.pdf

1. For each triangle, label every side relative to the indicated angle (hypotenuse, opposite or adjacent)
2. Solve for the indicated angle.

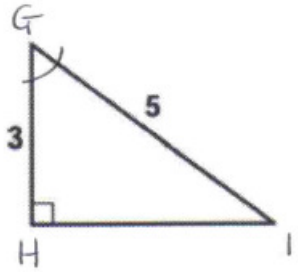
a)



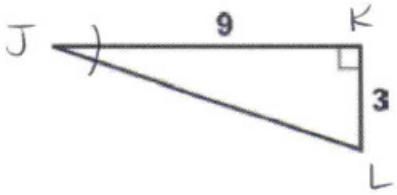
b)



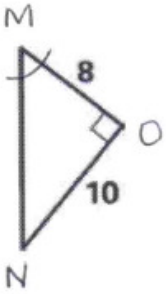
d)



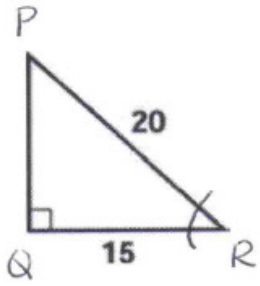
d)



e)



f)

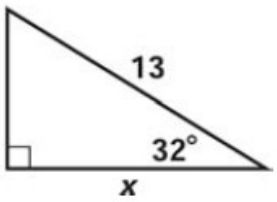


2.4.1a: Additional Practice - continued

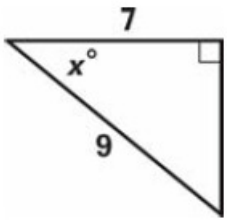
diagrams from http://www.mathweb.net/trig/pdfs/worksheets.pdf

Solve for the missing side or angle.

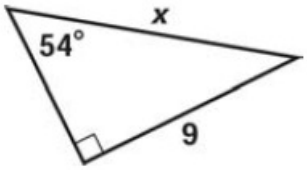
a)



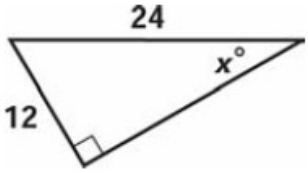
b)



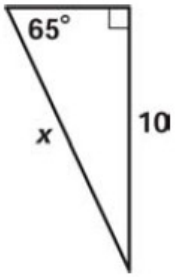
d)



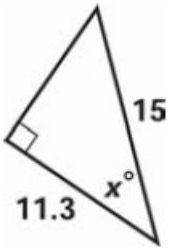
d)



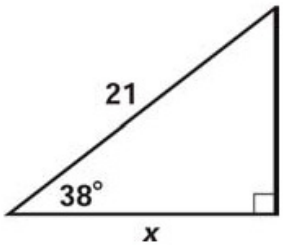
e)



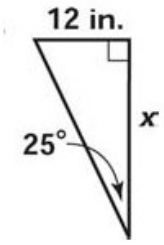
f)



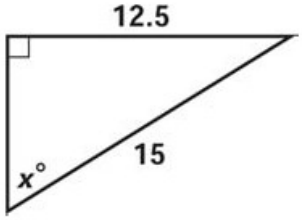
g)



h)

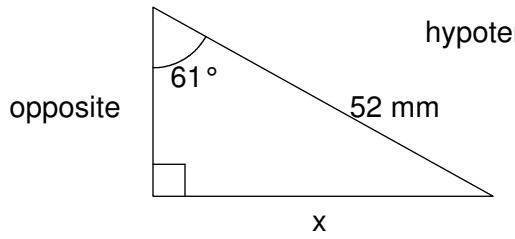


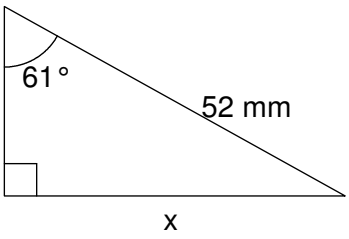
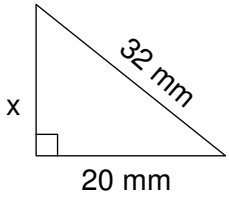
i)

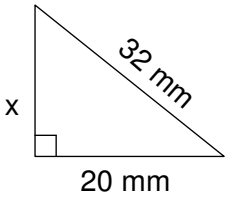


2.5.1: Going the Wrong Way

There are two problems shown below. For each problem, the answer provided is incorrect. Partner A will identify the errors in the given solutions. Partner B will write a correct solution to the problem.

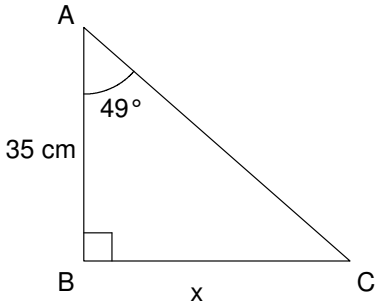
<table>
<tr><th>Partner A</th><th>Partner B</th></tr>
<tr><td>Solve for the missing side labelled x.
 

$\cos 61° = \frac{52}{x}$
$\frac{0.485}{1} = \frac{52}{x}$
$x = \frac{52}{0.485}$
$x = 107.2$</td><td>Solve for the missing side labelled x.
 
</td></tr>
<tr><td>Solve for the missing side x.
 

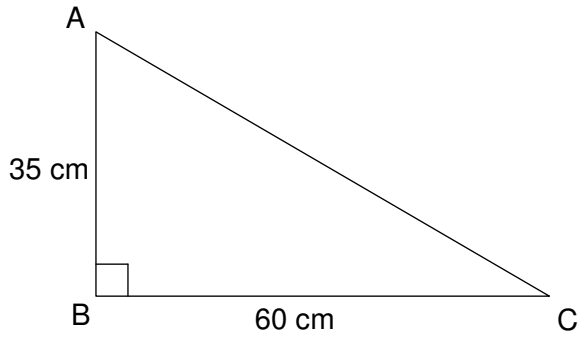
$x^2 = 20^2 + 32^2$
$x^2 = 1424$
$x = \sqrt{1424}$
x = 37.74</td><td>Solve for the missing side x.
 
</td></tr>
</table>

2.5.2: Tangent or Something else

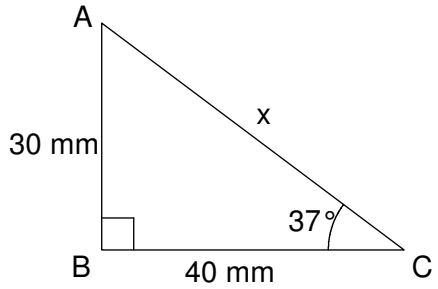
1. Decide whether to the use tangent ratio or the Pythagorean relationship to find *x*. Solve for *x*.



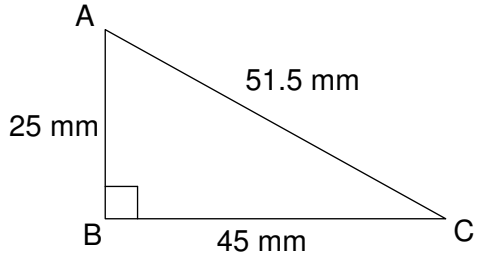
2. Decide whether to use the tangent ratio or the Pythagorean relation to find ∠A. Solve for ∠A.



3. Decide whether to the use tangent ratio or the Pythagorean relationship to find *x*. Solve for *x*.



4. Decide whether to use the tangent ratio or the Pythagorean relation to find ∠C. Solve for ∠C.



2.6.2: Applications of Trigonometry Assignment

Introduction

How would you find the height of a tree? You could climb to the top to measure it, but that would not be either safe or practical. How can we measure the height of clouds, airplanes or other highly inaccessible objects? Airports measure the clouds for pilots to let them know at what altitude they should fly. In this activity you will measure the heights of various objects using a single clinometer and trigonometric ratios.

You will measure the following heights:

1. _____

2. _____

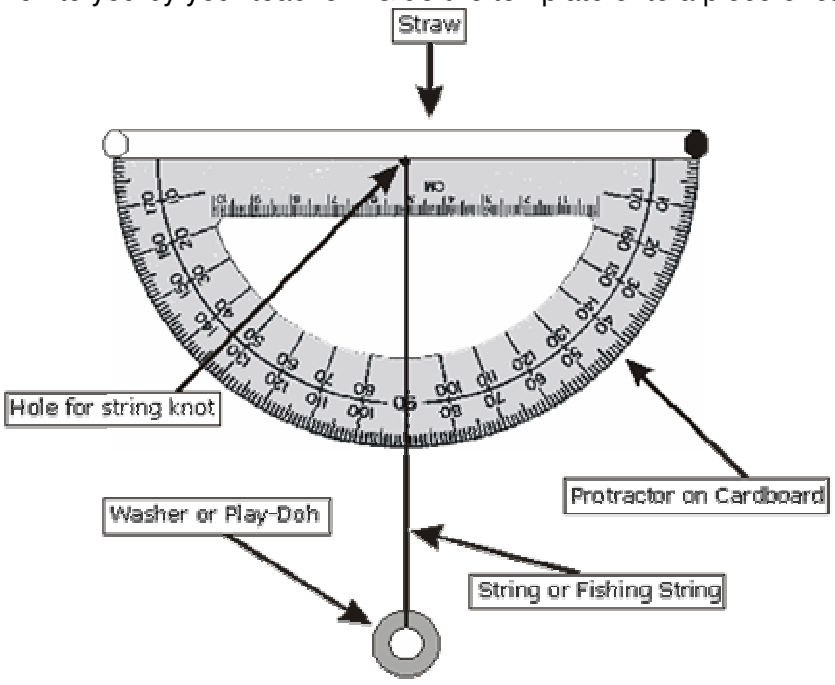
3. _____

You must hand in the following details:

→ Show a table of data
→ Show ALL calculations
→ Table of results
→ Sources of error

Building Clinometer

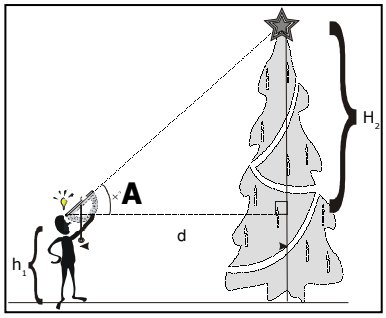
First you will need to make clinometer. You will be using the protractor template using the instructions on handout 2.6.1 given to you by your teacher. Glue the template onto a piece of cardboard.



2.6.2: Applications of Trigonometry Assignment (Continued)

Measuring Distances

Use a tape measure to find an appropriate distance back from the object you are finding the height of. Hold the clinometer level along the horizon line and adjust the angle of the straw to sight the top of the object through the straw.



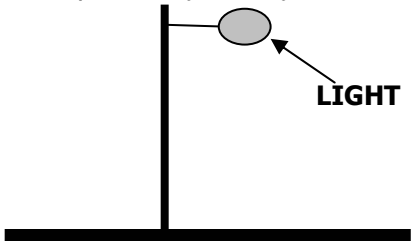
METHOD for finding inaccessible heights

Object Name	Height of person's eyes from ground (m)	Angle of Elevation (A)	Distance from Base (m)	Height of Object (Show work in box)

2.6.3: Applications of Trigonometry Assignment

Analysis

1. If you were to measure the height of a light sticking out from a post could you use today's method? Explain why or why not.

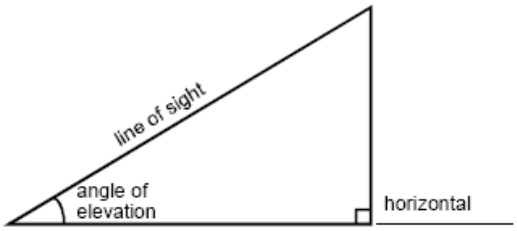


2. Darla is standing 15 m from the base of a building and using a clinometer she measures the angle of elevation to be 37°. If her eyes are 1.65 m above ground level, find the height of the building.

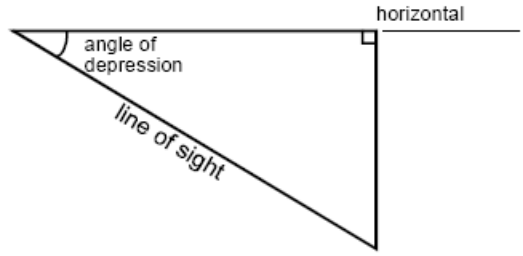
2.7.1a: Angles of Elevation & Angles of Depression

http://commons.bcit.ca/math/competency_testing/testinfo/testsyll11/trigonometry/solvertprobs/angelevdepr/angelevdepr.pdf

When a person looks at something above his or her location, the angle between the line of sight and the horizontal is called the **angle of elevation**. In this case, the line of sight is "elevated" above the horizontal.

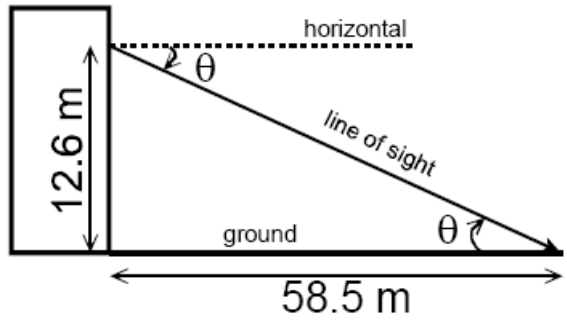


When a person looks at something below his or her location, the angle between the line of sight and the horizontal is called the **angle of depression**. In this case, the line of sight is "depressed" below the horizontal.



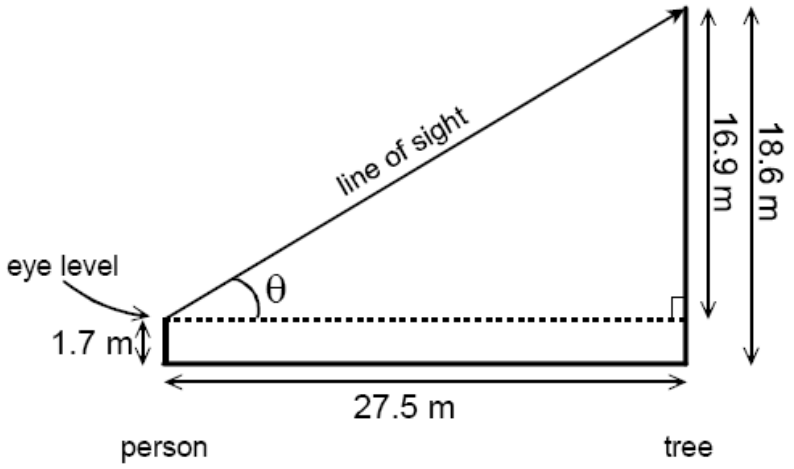
Since the vertical and horizontal directions are perpendicular, the elements of problems dealing with the relationship between lines of sight and the horizontal lead naturally to right triangles:

Example: A person stands at the window of a building so that his eyes are 12.6 m above the level ground. An object is 58.5 m away from the building on a line directly beneath the person. Determine the angle of depression of the person's line of sight to the object on the ground.



2.7.1a: Angles of Elevation & Angles of Depression

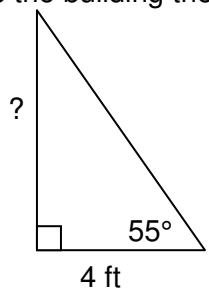
Example: Calculate the angle of elevation of the line of sight of a person whose eye is 1.7 m above the ground, and is looking at the top of a tree which is 27.5 m away on level ground and 18.6 m high.



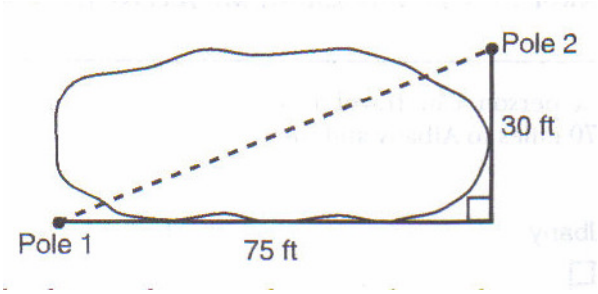
2.7.1 Applying Trigonometry

Solve the following problems.

1. A ladder is leaning against a building and makes an angle of 55° with level ground. If the distance from the foot of the ladder to the building is 4 feet, find, to the nearest foot, how far up the building the ladder will reach.



2. The Dodgers Communication Company must run a telephone line between two poles at opposite ends of a lake as shown below. The length and width of the lake is 75 feet and 30 feet respectively.



What is the distance between the two poles, to the nearest foot?

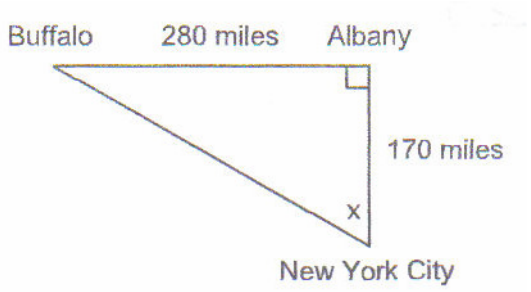
3. A ship on the ocean surface detects a sunken ship on the ocean floor at an angle of depression of 50°. The distance between the ship on the surface and the sunken ship on the ocean floor is 200 metres. If the ocean floor is level in this area, how far above the ocean floor, to the nearest metre, is the ship on the surface?

4. Draw and label a diagram of the path of an airplane climbing at an angle of 11° with the ground. Find, to the nearest foot, the ground distance the airplane has traveled when it has attained an altitude of 400 feet.

2.7.3: Applying Trigonometry

Solve the application questions. **Draw a diagram where necessary**.
Find angles to the nearest degree and distances to the nearest tenth of a unit.

1. a) If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, *x*, would she need to build the highway? Find the angle to the nearest degree.



b) To the nearest mile, how many miles would be saved by travelling directly from New York City to Buffalo rather than by travelling first to Albany and then to Buffalo?

2. In order to safely land, the angle that a plane approaches the runway should be no more than 10°. A plane is approaching Pearson airport to land. It is at an altitude of 850 m. It is a horizontal distance of 5 km from the start of the runway. Is it safe for the plane to land?

3. An 8 m long ramp reaches up a vertical height of 1 m. What angle does the ramp make with the ground?

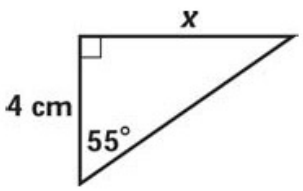
4. A tree casts a shadow 42 m long when the sun's rays are at an angle of 38° to the ground. How tall is the tree?

2.8 Trigonometry Review

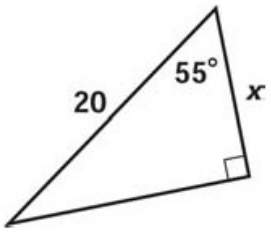
diagrams from http://www.mathweb.net/trig/pdfs/worksheets.pdf

1. Solve for the missing measurement using sin, cosine, tangent or the Pythagorean Theorem.

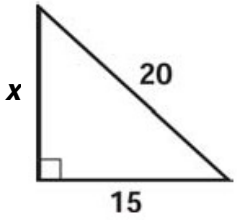
a)



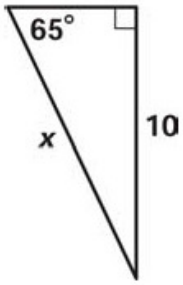
b)



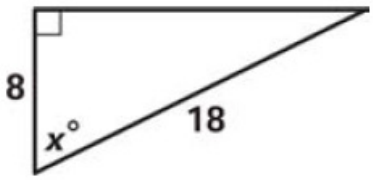
c)



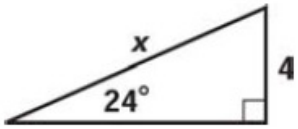
d)



e)



f)



2.8 Trigonometry Review (continued)

2. A tower casts a shadow 18 m long when the sun's rays are at an angle of 56° to the ground. How tall is the tower?

Diagram	Calculation

3. An airplane takes off and climbs at an angle of 12° with the ground. Find the horizontal distance the plane has travelled when it has reached an altitude of 1200 feet. **Round your answer to the nearest foot**.

Diagram	Calculation

4. A ladder 12 m long, leaning against a vertical wall makes an angle of 40˚ with the ground.

a) Draw a diagram for this situation.	b) How far is the foot of the ladder from the wall?
c) How high on the wall does the ladder reach?	d) What angle does the ladder make with the wall?
